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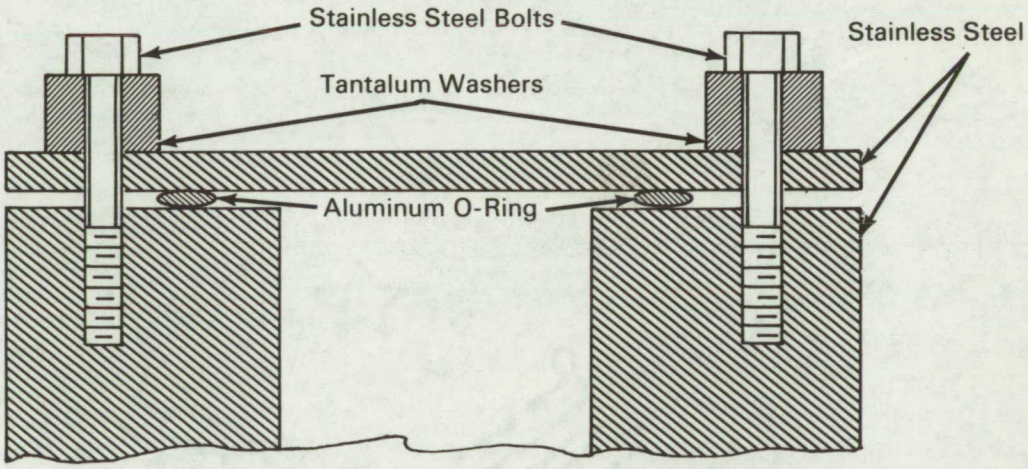
Brief 66-10325

NASA TECH BRIEF

Bimetallic Devices Help Maintain Constant Sealing Forces Down to Cryogenic Temperatures



The problem:

To maintain constant sealing forces, from room temperature to cryogenic temperature, on a metallic O-ring used in the vacuum sealing of various materials.

The solution:

The use of another metal (as washers for the seal bolts) with thermal expansion characteristics to compensate for the mismatch of the thermal coefficients of expansion of the stainless steel and aluminum used in the seal.

How it's done:

Two pieces of stainless steel are to be vacuum sealed using an aluminum O-ring compressed with stainless steel bolts. Since aluminum has a greater thermal coefficient of expansion than stainless steel over the critical distance of the compressed O-ring that separates the two surfaces being sealed, the aluminum will contract faster than the stainless steel in passage from room to cryogenic temperature. Compensation for this factor may be effected by introduction of a material for washers on the bolts, such as tantalum, which has a lower thermal coefficient of expansion than stainless steel. The washers are of sufficient thickness that the differential aluminum–stainless steel contraction is balanced by the stainless steel–tantalum differential expansion, which forces the one sealing surface to maintain contact with the aluminum O-ring with the original contact pressure.

Notes:

1. Other material combinations may be similarly compensated.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B66-10325

(continued overleaf)

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: W. R. DeBoskey
of Melpar Inc.
under contract to
Marshall Space Flight Center
(M-FS-800)